

Using Artificial Neural Networks to Interpret Well Logs and Optimize Production Strategies

Finding ways to use routine well-log data to validate models and optimize field processes

Researchers working in subsurface environmental restoration and in the petroleum industry have several areas of common interest. One area is the need to predict expensive-to-measure physical properties such as permeability, porosity, and conductivity from well-log data that are routinely collected. Accurate information on these physical properties is critical to constructing and using valid subsurface models.

The modeling issue, in turn, leads to a second area of common concern: the need to identify production- and injection-well configurations for optimum oil or contaminant recovery at minimum time and cost. Time-consuming simulations to determine how different well configurations affect recovery, time, and cost constitute a major computational bottleneck in assessing potential solutions.

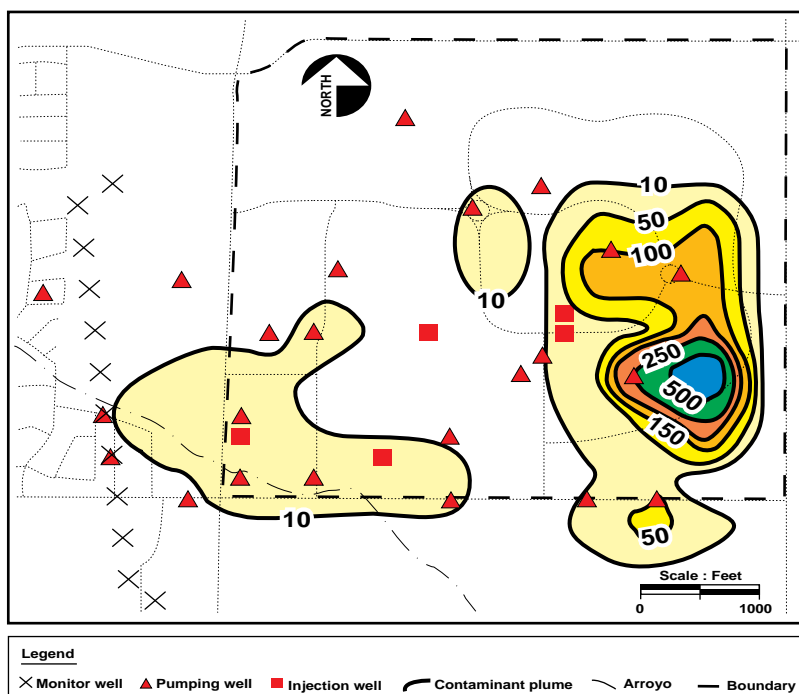
APPLICATIONS

- Process optimization
- Well-log interpretation

A unifying theme in both areas is the nonlinear nature of the phenomena being modeled or analyzed. Environmental scientists at LLNL have used artificial neural network technology to address the nonlinear aspects of both well-log interpretation and model-based optimization. We are seeking industrial partners to work on a project to apply and adapt these techniques to the corresponding problems in the petroleum industry.

Special capabilities

LLNL geoscience and computational researchers have applied artificial neural



A combination of artificial neural networks and the genetic algorithm have been used to reduce well requirements, and associated installation and maintenance costs, in groundwater remediation problems such as the one shown in the figure.

network analysis to a range of problems such as ray tracing, seismic event classification, earthquake prediction, and neural kriging of aquifer parameters. Our expertise extends from applying existing methods to developing software and designing algorithms.

Availability: We have demonstrated the concept and are looking for industrial partners with whom to apply and adapt the technique to specific petroleum industry problems.

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